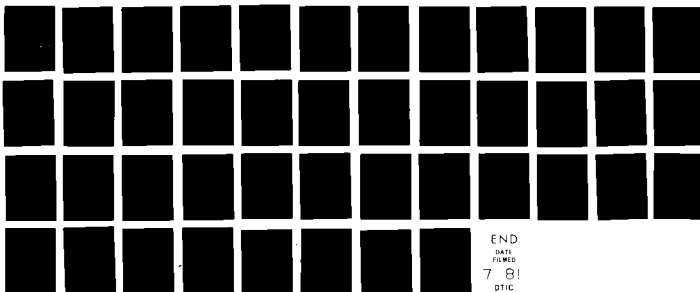


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confirmed the predictions. One intriguing result was that specific hard goal-KR subjects, despite performing best on the task as a whole, performed worst on one sub-element of the task which reflected degree of incidental learning. The implications of the findings are discussed.

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THE INTERACTION OF GOAL DIFFICULTY/SPECIFICITY
AND FEEDBACK ON TASK PERFORMANCE¹

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The Interaction of Goal Difficulty/Specificity and
Feedback on Task Performance

Abstract

Two experiments tested the hypothesis that the combination of specific, hard goals and knowledge of results (KR) will lead to better performance than do-best goals with and without KR and specific, hard goals without KR. It was also predicted that the latter three conditions would not differ significantly. The first study yielded equivocal support for the predictions, but these results were attributed to possible flaws in the design of the study. A second study which eliminated these potential flaws confirmed the predictions. One intriguing result was that Specific, Hard Goal-KR subjects, despite performing best on the task as a whole, performed worst on one sub-element of the task which reflected degree of incidental learning. The implications of the findings are discussed.

The Interaction of Goal Difficulty/Specificity and Feedback on Task Performance

Earlier research on the relationship of goal setting and task performance found that when goal setting was controlled, providing subjects with knowledge of their scores on a task did not motivate better performance than giving them no knowledge of their scores (Locke, 1967; Locke & Bryan, 1969; Locke, Cartledge & Koeppel, 1968). These studies indicated that feedback alone was not sufficient to increase task motivation. The studies did not reveal, however, whether goal setting alone was sufficient to improve task performance. While the Hard Goal-No KR subjects in the Locke (1967) and Locke and Bryan (1969) studies did not receive knowledge of their actual scores, they were given feedback regarding progress in relation to their goals. Thus, these studies did not include any genuine Goal-No KR condition.

Erez (1977) was the first to suggest that feedback is necessary for goals to affect task performance. In a correlational analysis of a laboratory experiment, she found that goal level only correlated with task performance level among subjects given knowledge of their previous scores on the task. This interaction effect is congruent with the findings of Becker (1978) and Strang, Lawrence and Fowler (1978). In a field study and a laboratory study, respectively, they found that individuals given hard goals plus feedback outperformed groups given: no goals and no feedback, hard goals without feedback, and easy goals with and without feedback. However, these studies did not include a No Goal-KR or Do Best-KR condition. (Locke et al., in press, report that No Assigned Goal

and Do Best Goal groups typically perform at the same level).

Thus, while Becker (1978) and Strang et al. (1978) have tested the interaction of goal difficulty with feedback (their design included Hard vs. Easy Goal and KR vs. No KR, as well as No Goal-NoKR conditions), no study has tested the interaction by completely crossing the factors of goal specificity/difficulty and feedback. This would require a 2 X 2 design with Specific, Hard Goals vs. Do Best (or No) Goals, and KR vs. No KR.

A number of studies have included three of the above four conditions. Landura and Simon (1977), Dockstader (Note 1). Latham, Mitchell and Dossett (1978), and Nemeroff and Cosentino (1979), found that Specific, Hard Goal subjects given KR outperformed Do Best subjects given KR, but that the latter subjects did not outperform those with Do Best Goals and No KR. No Specific, Hard Goal-No KR condition was included in these studies.

In contrast, Feeney ("At Emery Air Freight," 1973) and Komaki, Barwick and Scott (1978), like Becker (1978) and Strang et al. (1978) as noted above, found that Specific, Hard Goal subjects with KR outperformed those with No KR, but the latter subjects performed no better than Do Best Goal-No KR subjects. These studies did not include a Do Best-KR group.

Thus the first set of studies indicates that KR does not improve performance when no specific goals are set, while the second set demonstrates that specific, hard goals do not improve performance unless KR is provided. If we integrate the two sets of results, it can be predicted that the combination of

Specific, Hard goals and KR will lead to better task performance than any other combination and that these other combinations (Specific, Hard Goal-No KR, Do Best Goal-KR, Do Best Goal-No KR) should not differ from each other in effectiveness. The present studies constituted the first full test of these hypotheses.

Study 1
METHOD

Subjects. The subjects were 25 male and 69 female college students drawn from the Introductory Psychology subject pool. Students volunteered to participate and received extra credit for doing so. Each subject signed up (blind) for one of four possible sessions. Each session constituted a treatment.

Task ². The task was to score allegedly genuine performance appraisals of foremen used by a large forest products company. Each rating form was divided into ten sections covering different aspects of performance (e.g., "Interaction with Subordinates", "Safety", "Technical Competence", "Work Habits", etc.). Each section had seven behavioral items, each with seven possible responses (corresponding to verbal anchors from "Never true" to "Almost always true") on a one to seven scale. One of these numbers was circled in each case. The subject's task was to sum the seven circled numbers for each section and to find the mean score rounded to the first decimal. The subjects were given a 5-minute practice trial in order to familiarize themselves with the task. They were told to do their best on the practice trial, which also served as a work sample measure of ability. The main task consisted of a booklet containing 10 appraisal forms or 100 (10 X 10) sections. (Subjects who calculated all 100 means in less than the allotted

time were given an additional booklet.) The work period for the main task was 30 minutes and was divided into six unequal work periods of: 8'30"; 3'15"; 7'30"; 2'; 5'15"; and 3'30", separated by one minute rest breaks. Subjects did not know the length of the work periods but were told that they would be of "varying, random lengths." All answers were put on answer sheets.

Design and Procedure. The design was 2 X 2 fixed model. The fixed variables were Specific, Hard Goals vs. Do Best Goals, and KR vs No KR. The subjects in each condition were run in a group.

Specific, Hard Goal-KR (N=25). Each subject was assigned a specific, hard goal. The goal was based on the subject's own practice trial performance (i.e., ability) and norms obtained from a group of college students who had worked previously on the same task (see footnote 2). Each subject's goal was to attain a score (based on number correct) which would put him or her in the 90th percentile for students of his or her initial ability. After scoring the practice trial, each subject was given an appropriate goal progress sheet. This sheet indicated cumulatively how many problems were to be completed correctly by the end of each work interval, in order for the subject to reach the assigned goal by the end of the 30 minute work period. The subjects were told to check their progress during the one minute breaks by: seeing what section number they had completed on their answer sheet (which was numbered consecutively from 1 to 100), writing this number on their goal progress sheet, and comparing it to their assigned number for that interval. They were told that they might want to keep a little ahead of the assigned pace since they were bound to get some problems wrong.

Specific, Hard Goal-No KR (N=22). These subjects were assigned specific goals in the same manner as the Specific Hard Goal-KR subjects but were given no opportunity to monitor their progress toward it. They were not given a goal progress sheet, and the main task booklet had the sections arranged in random order and with varying numbers of sections or parts of sections per page. The answer sheets, rather than consisting of one page with 100 numbered spaces, consisted of 15 pages with between 1 and 12 answer blanks on each, placed at random places on the page. The answer blanks, however, followed the same sequence as the task booklets and the answer sheets were filled in going from left to right and top to bottom (thus, minimal search time was required). During rest breaks the answer sheets were put away so that the number completed could not be counted. Based on a 'time study,' subjects in this condition, (and in the Do Best-No KR condition) were given 90 additional seconds of work time to compensate for the extra search time and page turning when filling out the answer sheets. These extra seconds were proportionately distributed across the six work intervals.

Do Best Goal-KR (N=21). These subjects were told to do their best. So that they would not try to set a specific goal, such as trying to finish the whole booklet, they were told that they would not be able to finish the booklet in the time allowed. They were also told that the total work time would be somewhere around 25 and 35 minutes and that the intervals were of random length so that there was no way to determine their rate of progress. These subjects were given the same booklets and answer sheets as the Specific Hard Goal-KR subjects. Although the answer sheets were numbered from

1 to 100, thus providing KR, there was no obvious way to use them for the purpose of setting specific goals. Answer sheets were put away during the rest breaks.

Do Best Goal-No KR (N=26). As with the Do Best-KR group, no specific goals were assigned. Subjects were told to do their best. They were given the same type of task booklets and answer sheets as the Specific, Hard Goal-No KR subjects, with the problems in random order to prevent keeping track of progress and /or setting specific goals. Ninety seconds of additional work time were provided, as for the subjects in the Specific, Hard Goal-No KR group.

Post-experimental Questionnaires. All subjects filled out post-experimental questionnaires which asked them to indicate how much knowledge of their progress they had and the goals they were trying for.

Criterion Measures. For each subject both number correct and number attempted were computed for the practice trial, the main work period, and the six work intervals.

Reliability. The corrected Spearman-Brown split-half reliability estimate (task work periods 1,2,6 vs. 3,4,5) was .94 for both number correct and number attempted.

Ability Matching. A one-way F-test was conducted on the five minute practice trial scores of the four groups. There were no significant ability differences between the groups with respect to either number attempted or number correct.

Data Analysis. Gain scores were used in analyzing the data in order to eliminate within-group variance due to ability. The gain scores were computed as follows: depending on the criterion of interest (number attempted or number correct), the relevant 5-minute practice

trial score (ability measure) was multiplied by six and this product was subtracted from the total number attempted (or correct) on the 30-minute task.

To test the hypotheses an a priori t-test was constructed comparing the mean of the Specific, Hard Goal - KR group and the combined remaining groups (cf., Kirk, 1968, p. 74). Then, a one-way ANOVA was constructed in order to test for differences among means of the remaining three conditions (Specific, Hard Goal-No KR, Do Best-KR, Do Best-No KR). This combination of tests provide more powerful tests of the specific hypotheses of interest than the usual ANOVA.³ It was predicted that the a priori t-test would yield a significant difference, while the one-way ANOVA would be non-significant.

Results

The results for both criterion measures were the same; results for number attempted are reported here.⁴ The mean number attempted (gain scores) for each experimental group are shown in Table 1. The mean difference between the Specific, Hard Goal-KR group and the remaining three groups yielded a t-ratio of 5.66 (92 d.f., $p < .001$). Thus the first prediction was supported.

Table 1

Contrary to prediction, the 1 X 3 ANOVA on the Do Best-KR and the two No KR groups yielded a significant F-ratio of 4.68 (2,66 d.f., $p < .05$). This result was mainly due to the Do Best-

KR group performing better than the Do Best-No KR group (Tukey test; 2,66 d.f., $p < .05$).

Discussion

Although the results obtained in this study partially support our hypotheses, several factors preclude any definite interpretation of these results. First, from talking to subjects at the end of the testing session, we know that several in the Do Best-KR condition had set specific goals (e.g., to finish the whole set of 100 sections). Similarly, the success of the KR manipulation could not be determined; some No KR subjects claimed to have had as much KR as the KR subjects even though the design made this impossible.

Second, it is not certain that our time study on the effects of the different task formats was accurate. Thus, one possible interpretation of the main KR effect is that the KR format (numbered format in chronological order with one answer sheet) is faster, even with the 90 second time difference, than the No KR format (items in random order with multiple answer sheets). This, of course, would make the results largely an artifact of format.

Third, several subjects indicated that, after working on the task for a while, they were able to memorize the set of possible answers. Since there was a finite number of sums of the seven circled scores for each item, once the sum was computed, these subjects remembered the mean score for that sum. This skill may have been differentially acquired across the four conditions, thus confounding the results.

Fourth, many subjects in the Do Best conditions indicated they were competing by trying to work faster than other subjects. The effects of such competition are unknown but could serve to bias the results.

Finally, the post-experimental questions were poorly designed. Several of the manipulation problems noted above could not be clearly discerned from the subjects' responses to the questionnaire items.

These factors motivated a second study.

Study 2

Method

Subjects. The subjects were 36 male and 59 female college students drawn from the Introductory Psychology subject pool as in Study 1.

Task. The task was the same as in Study 1. Rather than using a single task booklet for the entire work period, however, a separate booklet was used for each work interval. Each booklet contained 50 percent more sections than the fastest subject in Study 1 could have completed. Furthermore, the subjects were told this. This modification precluded any (rational!) Do Best subject from setting a goal to finish a booklet.

Design and Procedure. The design was the same as in Study 1. The procedure was basically the same as in Study 1 with the following modifications: (1) The task booklets for all conditions were arranged in random order with varying numbers of sections or parts of sections on each page. This precluded any possibility of biasing the results due to different booklet

formats for the KR and No KR conditions. (2) Separate answer sheet booklets were distributed for each work interval. As in Study 1's No KR conditions, these booklets consisted of several pages, with randomly placed answer blanks following the same random, numerical sequence as the task booklets. KR subjects simply counted up the number of sections completed after each work interval, while the No KR subjects did not. The Specific, Hard Goal-KR subjects entered their scores on their goal progress sheets as in Study 1, while the Specific, Hard Goal-No KR subjects did not. Thus, all KR subjects were able to count the number of items completed during each of the six intervals, but only the Specific, Hard Goal subjects could keep track of their progress toward a goal for the complete task. (3) Two practice trials were administered, two and five minutes long, respectively. The first trial was designed to familiarize the subjects with the arithmetic nature of the task; the second trial matched the random-order format of the main task booklets and thus resulted in the subjects' complete understanding of the nature of the task. (4) Subjects were also given a post-experimental ability test to determine the degree to which they had memorized division by seven. The test consisted of 20 sums within the set of possible sums computed during the main task. Subjects were to divide each sum by seven and round to the first decimal, just as they had done during the main task. The total number completed (or completed correctly) within one minute constituted the subject's score. It was hypothesized that this measure would depend in part upon initial ability and in part upon skill

acquired during the experiment. Thus, this measure could be treated as both an independent and a dependent variable.

(5) In order to reduce the possible effects of competition, subjects were seated facing a wall during the experiment and continuously reminded that the task was an individual one; the experimenter ensured that subjects did not converse with one another at any time. The four conditions along with the N's for each group are summarized below.

Specific, Hard Goal-KR (N=26). Subjects counted the number of sections completed after each trial and entered them on a goal progress sheet, which indicated how many they should have completed. Goals were set at the 90th percentile for subjects of the same ability based on Study 1.

Do Best Goal-KR (N=24). Subjects counted the number completed after each trial and were told to do their best.

Specific, Hard Goal-No KR (N=21). Subjects were assigned a goal to reach by the end of the last trial, set at the 90 percentile for subjects of the same ability. They did not count the number completed after each trial.

Do Best Goal-No KR (N=24). Subjects were told to do their best and did not count the number completed after each trial.

Post-Experimental Questionnaire. At the end of the experiment, subjects completed a questionnaire which was carefully designed to avoid the ambiguities inherent in the Study 1 questionnaire. The items included: (1) what goals they were actually trying for; (2) the amount of knowledge they had regarding their performance; and (3) whether or not they competed with anyone else in the room.

Criterion Measures. The criterion measures were total number attempted and total number correct as in the first study.

These were computed for the five minute practice trial, for each work interval, and for the total work period.

Reliability. The corrected Spearman-Brown split-half reliability estimate was .98 for number attempted and .95 for number correct.

As in Study 1, the halves were comprised of total performance on work intervals 1, 2 and 6 versus intervals 2, 4 and 5.

Ability Matching. A one-way F-test conducted on the five-minute practice trial scores of the four groups yielded no significant ability differences with respect to number attempted; however, for the number correct, the means were significantly different at the .057 level ($F=2.59$; 3,91 d.f.). The one-way F-test conducted on the post-experimental division test scores of the four groups yielded significant ability differences for both number attempted and number correct ($F=4.79$; 3,91 d.f., $p<.01$ and $F=4.01$; 3,91 d.f., $p=.01$, respectively). The correlation of the five-minute practice trial and post-experimental division test scores for number attempted was .50; for number correct, $r=.49$.

Data Analysis. Data were analyzed using the same procedures as those used in Study 1, except that due to the ability matching results noted above, the five-minute practice trial scores and the post-experimental division test scores were considered as potential covariates. It was predicted that after partialling out the covariate(s), the a priori t-test of the interaction hypothesis would yield a significant difference, while the

one-way analysis of covariance among the remaining three groups would not be significant.

Results

Manipulation Checks. On a four point scale (1="I had exact knowledge of the number of sections completed," to 4="I had no knowledge at all of the number of sections completed"), the mean of the KR subjects was 1.86 while that of the No KR subjects was 3.29 ($t=7.18$, 93 d.f., $p<.001$); thus, the KR manipulation was successful. The degree of success for the goal manipulation is discussed below.

Homogeneity of Slopes Test. Covariate analyses assume that there is no interaction between the covariate(s) and the treatment. This assumption was tested and no significant differences were found among the regression coefficients for the four groups (cf., Kerlinger & Pedhauzer, 1973, p. 267).

All Subjects (N = 95). Table 2 (top figures in each cell) shows the adjusted (for ability) mean total number attempted for each condition.⁵ The performance of the Specific, Hard Goal-KR group was significantly higher than that of the remaining three groups combined ($t = 2.13$; 92 d.f., $p<.05$). However, the 1 X 3 analysis of covariance on the Do Best-KR and the two No KR groups yielded a significant F-ratio of 3.95 (2,65 d.f., $p<.05$). Pairwise comparisons among the means (Tukey's HSD procedure, $p=.05$) showed that the Do Best-KR group performed significantly better than the Specific, Hard Goal-No KR group.

Table 3 (top figures in each cell) shows the adjusted mean total number attempted for each condition, adjusted for both pre-experimental ability and the post-experimental division test scores. The t-ratio for the difference between the Specific, Hard Goal-KR condition and the three remaining conditions was 3.37 (91 d.f., $p < .001$). Again, however, the oneway analysis of covariance yielded a significant F-ratio of 3.79 (2,64 d.f., $p < .05$). The Tukey test indicated that the Do Best-KR group performed significantly better than the Specific, Hard Goal-No KR group.

Given the above results, it is evident that a more parsimonious explanation of the findings might be that there was a main effect for feedback and little else. However, answers to the post-experimental questionnaire indicated that six subjects in the Do Best Goal-KR condition said they were competing with other subjects during the experiment

Tables 2 & 3

The effect of breaking this group down into competitors and non-competitors is shown in Note d to Table 2. Competitors performed significantly better than non-competitors. Since there were six competitors in the Do Best-KR group and only seven in the remaining three groups, this could have biased the results. Thus, another analysis was undertaken dropping all subjects who said they were competing.

Non-Competitors (N=82). The adjusted (for pre-experimental ability) mean total number attempted for non-competitors only are shown for each group in the second row of each cell in Table 2. The t-ratio for the difference between the Specific, Hard Goal-KR group and the remaining groups was 2.40 (79 d.f., $p < .001$). When both ability and division score were controlled, the t was 3.48 (78 d.f., $p < .001$). The one-way analysis of covariance was not significant in either case. Therefore, when the effects of competition are eliminated, our hypotheses are fully supported.

The post-experimental goal question indicated that a number of subjects claimed not to be trying for their assigned goals. Thus, a third analysis was undertaken including only subjects who claimed to be trying for their assigned goals and who were not competing.

Non-Competitors Trying for Assigned Goals (N=48). The adjusted mean total number attempted scores for these subjects are shown in the third row of each cell of Table 2. The corresponding means using both covariates are shown in the third row of each cell of Table 3. For number attempted, controlling for pre-experimental ability, the t-ratio for the difference between the Specific, Hard Goal-KR group and the remaining groups was 1.73 (45 d.f., $p < .05$). Controlling for both types of ability, the t-ratio was 2.40 (44 d.f., $p < .01$). The 1 X 3 analyses of covariance were not significant. Therefore, when goal setting is controlled and the effects of competition are eliminated, the hypotheses are fully supported.

Observe that in all analyses the significance of the results was enhanced by the addition of the second covariate, the post-experimental division test.

DISCUSSION

If we assume that the findings of Study 2, as a result of the procedural changes, are more internally valid than those of Study 1, then our hypothesis is supported. There is an interaction effect between goals and KR. If either is absent, the effect is the same as if both are absent. Without a goal or standard against which to judge progress, knowledge of one's score on a task is of little use.

Similarly, without knowledge of one's progress in relation to a goal or standard, it is unlikely that the goal will be consistently attained or approached, especially if the goal is hard. These results therefore support Locke's (1977, 1980) contention that behavior modification studies which claim feedback functions as a "reinforcer" may be in error when they attribute motivational effects to KR alone. The effects are more likely to be due to the joint operation of goals and feedback.

It might be argued from examining the means in Tables 2 and 3⁶ that the most parsimonious explanation of our data would still be that there was a main KR effect and little else. To test this hypothesis, we conducted a series of moderated regression analyses on the Study 2 data. Considering the non-competitors and non-competitors who accepted the goals only, it was found that the main effect for KR was significant for number attempted when only

the KR and Goals factors were entered into the equation. In all cases this main effect disappeared when the interaction factor was included. This indicates that the main KR effect was an artifact of the interaction effect. However, it also should be noted that the interaction effect was not significant in the above regression analyses. This supports our initial argument that traditional analysis of variance approaches are not designed to test specific, predicted interactions and are therefore less powerful than the approach we used.

The results for number correct were similar to those for number attempted except that that main effect for KR was typically not significant even when KR and Goals were entered without the interaction factor.

While we could have presented the Study 2 data for only the non-competitors who said they were trying for their assigned goals (and thus reduced the problem of multiple t-tests on correlated sets of data) we thought it would be instructive to document the effects of competition especially, by showing that the data conform even more closely to predictions when this source of confounding is removed. The means for the smallest group, non-competitors who claimed to be trying for their assigned goals, are probably a bit unstable. The Hard Goal-No KR group for example was reduced to an N of 3 at this point.

The response of subjects being provided with KR but no goals and goals but no KR is an interesting phenomenon in itself, over and above the effects on performance. In the first study a number of Do-Best-KR subjects, deprived of any assigned goals, promptly set goals of their own, namely to finish the task booklet by the end of the experiment. When this was prevented in study 2, some subjects in that experiment chose to compete with other subjects in the room. While most subjects were seated facing a wall, competition was still possible because subjects could hear pages being turned and could observe the progress of the one or two subjects sitting closest to them.

Providing subjects with knowledge of their performance seems to encourage them to try to find a standard against which to measure how well they are doing or how good they are. Such competition also may provide a measure of excitement and relief from boredom, a motive observed in factory situations by Whyte (1955). While providing both KR and goals did not lead to a high frequency of competition in this study, in field settings specific goal-KR groups often engage in spontaneous competition (see Locke, 1980). The effect of the standards may be to imply that the KR is important or significant.

In view of the difficulty we had in preventing the Do Best-KR subjects from setting goals, the consistent results of the field studies discussed earlier are puzzling. None of the Do Best-KR groups in the Bandura and Simon (1977), Dockstader (Note 1), Latham, Mitchell

and Dossett (1978) and Nemeroff and Cosentino (1979) studies performed above the level of the Do Best-No KR or No Goal-No KR groups. Perhaps the "demand characteristics" of laboratory experiments increase the likelihood that KR will be translated into goals or perhaps college students constitute a different population than workers in typical field studies. In a comprehensive review of the goal setting literature, Locke et al. (in press) argue that personality traits, e.g., need for achievement would be most likely to emerge when subjects were free to set their own goals rather than being assigned goals. A Do Best-KR experimental condition might be more likely to encourage self-set goals in high need achievement subjects than would the same condition in a field setting which lacked both demand characteristics and high need achievement employees.

The effects of competition were potent enough in Study 2 to warrant more systematic study of this incentive. White, Mitchell and Bell (1977) found a strong effect for what they called "evaluation apprehension" which consisted of telling the subjects that their performance would be compared to that of others. Competition may be one factor which accounts for the well known "social facilitation" effect (Geen & Gange, 1977). Locke (1968) has argued that competition may affect performance by affecting the level at which goals are set and/or the degree of commitment to these goals.

In contrast to the Do Best-KR subjects who often tried to set goals which they were not asked to set, the Specific, Hard Goal-No KR subjects typically failed to accept the goals which they were

asked to try for. Only three subjects in this condition claimed they were trying for precisely the assigned goals. The remainder tried to do their best or less than their best. This finding suggests that when subjects are given specific, hard goals but no means to keep track of their progress in relation to them, the goals become virtually meaningless. It's like telling an individual; "Do 50 push-ups, but I will prevent you from keeping track of how many you have done and I will not tell you when you reach 50." Under such conditions, a do best goal may be the most reasonable alternative.

The fact that the significance of our results was enhanced by the addition of the post-experimental ability covariate suggests that the post-experimental division test scores may have been lower for Hard Goal-KR subjects than the Do Best subjects and Specific, Hard Goal-No KR subjects. Table 4 shows that this is, in fact, the case. The adjusted (for pre-experimental ability) mean division score for number attempted of the Specific, Hard Goal-No KR group was significantly lower than that of the other three groups combined ($t = 3.63$, 92 d.f., $p < .01$) using the data for all subjects. The 1 X 3 analysis of covariance yielded no significant differences between the Do Best and Specific, Hard Goal No KR groups. These findings were replicated for the non-competitors and for the non-competitors trying for assigned goals; results for number correct were the same for all analyses.

Table 4

Thus having a specific, hard goal with feedback actually inhibited the memorization or automatization of one component task skill. This effect was compensated for by greater effort on the part of Specific, Hard Goal-KR subjects leading to higher performance. In effect, they tried harder but learned less in the process.

If we consider memorizing or automatizing division by seven to entail incidental learning in the context of this experiment, then these results might be interpreted within the framework of previous research on the effect of arousal on task performance. In a review of research on the effects of money incentives on performance (in laboratory tasks) McGraw (1978) found that performance was facilitated in all but one category of task. Tasks which are both intrinsically interesting and "heuristic" (which require new integrations or connections to be made) are performed more poorly under incentive payment than without incentives. McGraw (1978) speculates that when arousal is very high, the individual is so totally focused on getting results that incidental learning and exploration of different means of getting the results (e.g., discovering heuristics, making creative integrations) is inhibited. On tasks where such processes are crucial for task performance, overall progress is inhibited. In the present study it seems likely that the task was not intrinsically interesting and did not require creative integrations; thus overall performance under high motivation conditions was enhanced. But one element of the task, which would be learned only incidentally, if at all, was learned less well under these conditions.

Another explanation of the post-experimental test score results is possible. The Specific, Hard Goal-KR group could have become more fatigued than the other groups as a result of the greater effort expended during the main task. This could have led to lower scores on the post-experimental division test, independent of any real differences in ability on this measure. While this interpretation seems unlikely due to the short time period of the main task, it cannot be ruled out.

This is the only documented case which the authors know of in which the same set of conditions led to better performance on the task as a whole and poorer performance on one element of the same task as compared to other conditions. Clearly this finding is worth further exploration.

Footnotes

1. This study was supported by Contract No. N00014-79-C-0680 from the Office of Naval Research. Reproduction is permitted for any purpose of the U.S. Government
2. The authors are indebted to Gary Latham and Lise Saari of the University of Washington for developing this task and for making it available for the present study.
3. For example, the one degree of freedom test for interaction in a 2x2 ANOVA tests for all patterns of interactions; however, the a priori t-test used in this study tests specifically for the alternative of interest (that is, the mean of the Specific, Hard Goal-KR groups versus the mean of all other groups combined). Therefore, this provides a more powerful test of the hypothesis than ANOVA.
4. Data for the second criterion may be obtained by contacting the senior author.
5. The pattern of results for both number attempted and number correct was the same. Data for number correct may be obtained from the senior author.

6. The means for number correct are more obviously consistent with the interaction hypothesis. The number correct means for non-competitors (and non-competitors who accepted their goals, shown in parentheses) were: Specific, Hard Goal-KR: 71.48 (71.68); Specific, Hard Goal-No KR: 62.59 (67.28); Do Best Goal-KR: 67.44 (70.19); Do Best Goal-No KR: 67.64 (67.96).

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Table 1

Mean Gain Scores for Number Attempted for Experimental Groups
(Study 1)

	<u>KR</u>	<u>No KR</u>
Specific,Hard Goal	23.68	3.64
Do Best Goal	13.05	1.15

Table 2

Adjusted (for pre-experimental ability) Mean Total Number

Attempted for Experimental Groups

(Study 2)

	KR	No KR
Specific, Hard Goal	84.49 ^a	74.32
	(84.99) ^b	(74.99)
	[86.12] ^c	[76.53]
Do Best Goal	83.77	77.58
	(82.02)	(77.50)
	[83.57]	[77.67]

- a. Data for all subjects (N=95) given in first row of each cell.
- b. Data for non-competing subjects only (N=82) given in second row of each cell.
- c. Data for non-competing subjects who worked toward assigned goals (N=48) given in third row of each cell.
- d. Within the Do Best-KR group, subjects who competed with others performed significantly better than subjects who did not compete ($t=2.40$, 21 d.f., $p < .05$).

Table 3

Adjusted (for both pre and post-experimental ability)

Mean Total Number Attempted for Experimental Groups

(Study 2)

	KR	No KR
Specific, Hard Goal	86.88 ^a	74.05
	(87.28) ^b	(74.33)
	[87.97] ^c	[75.16]
Do Best Goal	82.59	76.40
	(81.09)	(76.10)
	[82.86]	[76.65]

- a. Data for all subjects (N=95) given in first row of each cell.
- b. Data for non-competing subjects only (N=82) given in second row of each cell.
- c. Data for non-competing subjects who worked toward assigned goals (N=48) given in third row of each cell.

Table 4

Adjusted (for pre-experimental ability) Mean Total Number
Attempted on Post Experimental Division Test

	KR	No KR
Specific, Hard Goal	5.10 ^a	6.51
	(5.18) ^b	(6.57)
	[5.40] ^c	[7.32]
Do Best Goal	7.00	6.99
	(6.69)	(6.92)
	[6.92]	[7.11]

- a. Data for all subjects (N=95) given in first row of each cell.
- b. Data for non-competing subjects only (N=82) given in second row of each cell.
- c. Data for non-competing subjects who worked toward assigned goals (N=48) given in third row of each cell.

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P4-5/A7

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P4-5/A14

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P4-5/B4

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P4-5/B5

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P4-5/B6

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